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ABSTRACT

In a study that investigated differences in the processing styles of beginning readers, a Pictograph Sentence Memory Test (PSMT) was administered to first and second grade students to determine their processing style as well as to assess instructional effects. Based on their responses to the PSMT, the children were classified as either visual or auditory processors and were placed into one of three groups. Those in the imagery group were shown cartoon slides of pictograph sequences and told to imagine similar cartoons for subsequent sequences to help them remember the pictures better. Those in the sentence strategy group were told to read the pictographs like a sentence in order to remember them better. The control group children were instructed only to try hard to remember the pictographs. Measures of imagery ability, reading ability, and metacognitive ability were also administered. The findings suggest that there are substantial differences in processing styles that relate to learning. (FL)

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Visual or Auditory Processing Style and Strategy Effectiveness

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VISUAL OR AUDITORY PROCESSING STYLE AND STRATEGY EFFECTIVENESS

Reading is a task that seems natural and easy for some children, while for others it is quite a formidable task. Good and poor readers have been found to differ in their effective use of organizational strategies (see Golinkoff, 1976). When poor readers are trained to use certain of these strategies, their comprehension improves. Although there is some research investigating the relative effectiveness of different strategies, few studies have examined whether some strategies are more effective for certain children than others (for exceptions see Gustafsson, 1977; Levin, Divine-Hawkins, Kerst & Guttman, 1974; Richardson, 1978; Riding & Calvey, 1981). Individual differences in the nature and rate of cognitive development could influence the effectiveness of organizational strategies for beginning readers.

In this study, measures of both imagery and verbal ability were administered and the extent to which each child tended to process information auditorily or visually was assessed. These differences were then related to the child's ability to benefit from either imagery or sentence integration instructions. In order to circumvent decoding problems and to enhance the potential for effective use of imagery, a pictograph sentence memory task was used (Ryan & Ledger, 1982).

The relationship between metacognitive ability and semantic integration was also investigated. Both metamemory and metareading have been found to be related to children's ability to profit from minimal instructions and to maintain and generalize learned strategies (Baker & Brown, in press; Ryan and Ledger, 1982). This study examined how metacognition relates to children's spontaneous integration of pictographs and to their ability to learn from brief organizational instructions.

Method

A Pictograph Sentence Memory Test was used to determine processing style as well as to assess the instructional effects. The children were first taught the name for each of a set of 34 pictographs (simple line drawings, each representing a word).

After reaching criterion, the children were given the Pictograph Sentence Memory Pre-Test in which they "read" a meaningful sequence of pictographs (e.g., THE dog give(s) THE red flower to THE little boy) and recalled them after a short delay (see Figure 1). The child's preferred processing style was assessed by giving trials with either auditory or visual interference. Children who were interrupted more by visual interference were classed as visual processors, and those more interrupted by auditory interference were classed as auditory processors.

For the target task, auditory and visual processors were divided into three groups - imagery, sentence and control. The groups were equated on original PSMT performance, processing style and grade. Children in the imagery and sentence strategy groups were briefly taught to integrate the pictographs in order to remember them better. In the imagery condition the child was shown a "cartoon" slide of what the pictograph sequence meant, and was instructed to imagine a similar cartoon for each subsequent sequence in order to remember the pictures better. The sentence strategy group was instructed to read the pictures like a sentence inserting the omitted articles and verb inflections. The control group was instructed only to try hard to remember the pictures.

Recall on the PSMT was scored in terms of both accuracy and order. Several process measures, including the number of articles correctly inserted in the pictograph sentences, the proper use of verb inflections and the occurrence of auditory and silent rehearsal during each delay period were recorded as well.

Measures of imagery ability (PMA - Spatial Relations Test and the Corners test), reading ability (Gates MacGinitie Comprehension Test), questions concerning the child's awareness of his or her own memory process and the purposes of reading, and the Peabody Picture Vocabulary Test were also administered.

Results and Conclusions

Approximately 2/3 of the children were classified as auditory processors and 1/3 as visual processors. Neither verbal nor imagery ability was related to processing style.

A 3-factor ANCVA (grade x processing style x instructional condition) was conducted on post-test scores. A significant main effect was found for instructional group ($F=15.31$, $p<.001$), as well as a significant interaction between instructional group and processing style ($F=6.47$, $p<.005$). Additional analysis confirmed that for auditory processors there was no significant difference between the sentence and imagery instructional conditions. However, both were significantly better than the control group. For the visual processors, no significant difference was found between control and imagery conditions, with the sentence group doing considerably better (see Figure 2). These results show that while the sentence processing strategy is effective for most first and second graders, the imagery strategy is only effective for the subpopulation of auditory processors.

For the process measures, a main effect for instructional group was found for both article insertions ($F=34.25$, $p<.001$) and verb inflections ($F=6.21$, $p<.05$). with the sentence group (the only group trained to use these measures) doing considerably better. A triple interactions was found for the number of articles inserted while reading the pictograph sentences ($F=3.36$, $p<.05$). First grade auditory processors made significantly more insertions under sentence instructions than did first grade visual processors (see Table 1).

Performance on the PSMT was related to the children's metamemory, reading comprehension, imagery ability and verbal ability. Moreover, these measures in addition to the process indices, predicted approximately 70% of the variance under imagery and sentence conditions.

A possible explanation for these results is that children need both to be able to think of the sequence as a sentence and to visualize its meaning. Among the children who were instructed on the sentence component, those with higher imagery ability did better. Among the children who were only instructed to visualize the sequence, those who had an auditory processing style and those who rehearsed did better. More research is necessary to confirm this tentative interpretation.

The present study helps to clarify for which children and under which conditions imagery will be an effective strategy. Past research has suggested age to be an important variable in determining the effectiveness of imagery instructions (Levin & Pressley, 1978). However, processing style may also have important contributions since older visual processors did not profit from imagery instructions although younger auditory processors did. Although no differences were found in processing style between first and second graders, it would be interesting to see if there are changes in processing style over a wider age range and if these differences coincide with the effectiveness of an imagery strategy. It could be that more children use an auditory processing style as they get older or that imagery becomes an effective strategy even for visual processors as they get older.

The dramatic improvement in performance that occurred following integration instructions implicates the importance of semantic integration for recall. When children considered each pictograph as a discrete "word", as in the control condition, recall was slightly less than 40%; however, once either a sentence strategy or an interactive imagery strategy was applied recall rose to approximately 70% and 60%, respectively. Although the PSMT is not as complex a task as real reading since decoding is not required and only single sequences were presented, the analogy to reading should be apparent. Some poor readers may approach the reading task in a manner similar to the control group on the pictograph sentence task in that they tend to see each word as a discrete unit. If so, recall and subsequent comprehension will obviously be quite poor. However, if these poor readers can be taught appropriate integration strategies, a similar improvement in reading comprehension would be expected.

The importance of metamemory in beginning reading was confirmed, but the results were neither strong nor consistent across groups. The prediction that children high in metamemory would do better under the interference conditions was confirmed for first graders only. Also, metamemory significantly predicted performance only with imagery instructions. However, both the

PSMT pre-test and the Gates MacGinitie were significantly correlated with metamemory for both the first and second graders.

Although processing style has been studied in regard to learning disabled children, little research has investigated this variable in average children. This study indicates that there are substantial differences in processing style which relate to learning. More research is necessary to substantiate this relationship and to confirm the stability of the processing style variable. Further research would also be valuable to support the explanation that both the imagery and sentence components are necessary for maximal integration, perhaps by comparing the effectiveness of a strategy incorporating both components to either strategy separately. The interaction between style and the three strategy conditions in regard to their maintenance and generalization is another area of further investigation.

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(The) boy give(s) (the) red flower to (the) horse.

FIGURE 1

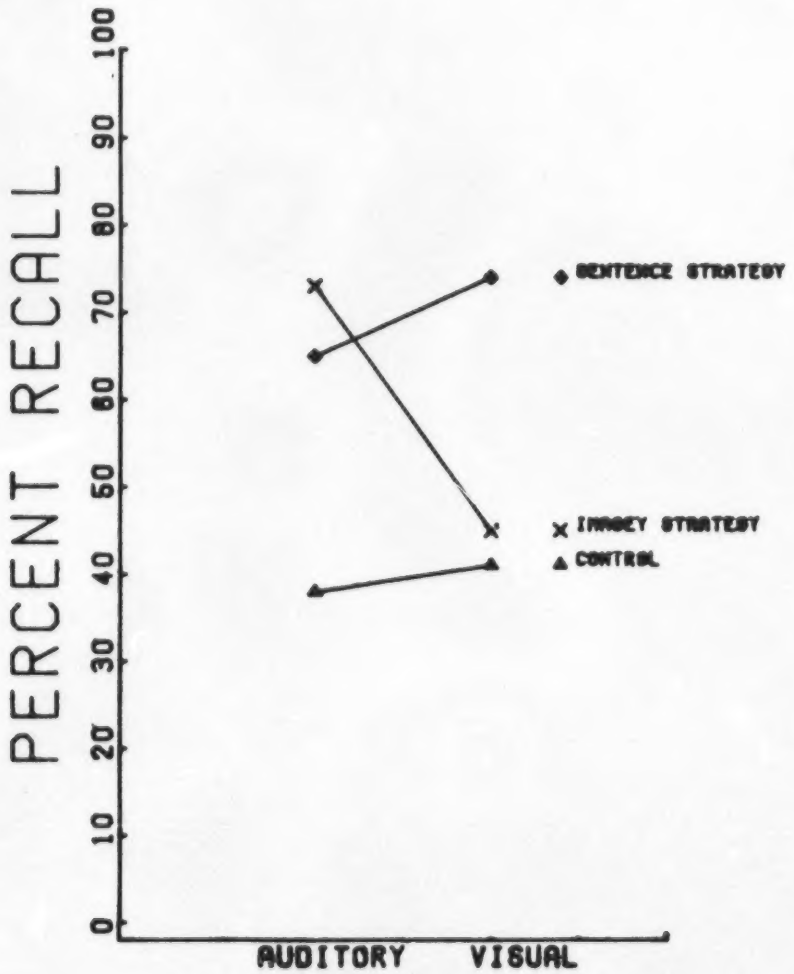

FIGURE 2 - PERCENT RECALL ON PICTOGRAPH SENTENCE POST-TEST

TABLE 1

PERCENTAGE OF ARTICLES READ

	Auditory Processors	
	Grade	
	1	2
Imagery Condition	0	0
Sentence Condition	79	38
Control Condition	0	0
	Visual Processors	
	Grade	
	1	2
Imagery Condition	0	0
Sentence Condition	16	33
Control Condition	0	0